



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/451,084	11/30/1999	MIKHAIL AKOPYAN	PM-264880	8576

23459 7590 11/08/2002

ARTHUR J. O'DEA
LEGAL DEPARTMENT
COGNEX CORPORATION
ONE VISION DRIVE
NATICK, MA 01760-2077

EXAMINER

KIBLER, VIRGINIA M

ART UNIT	PAPER NUMBER
----------	--------------

2623

DATE MAILED: 11/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/451,084

Applicant(s)

AKOPYAN ET AL.

Examiner

Virginia M Kibler

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: "FIG" should be changed to "Fig" on page 3, line 7; "6" should be added after "storage" on page 4, line 7; and "p202" should be changed to "P202" on page 5, line 24.

Appropriate correction is required.

Claim Objections

2. Claim 1 is objected to because of the following informality: "a" should be added after "training" in the last line. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 12 recites the limitation "the respective models" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3, 4, 6, 14, 21, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Nichani et al. (5,673,334).

Regarding claim 1, Nichani et al. ("Nichani") discloses a method for training a system to inspect a spatially distorted pattern (Col. 3, lines 65-67). The method comprises receiving a digitized image of an object 54 (Figure 4). The image includes a region of interest which is divided into a plurality of windows or "sub-regions" (Col. 7, 40-43). Nichani also discloses training a search tool and an inspection tool for a respective model for each of the plurality of sub-regions (Col. 6, lines 26-30), building a search tree for determining an order for inspecting the plurality of sub-regions (Col. 9, lines 17-21), and training a coarse alignment tool 78 for the region of interest (Col. 7, lines 1-2).

Regarding claim 3, Nichani discloses building of a search tree comprising establishing the order so that transformation information for located ones of sub-regions is used to minimize a search range for neighboring ones of the sub-regions (Col. 9, lines 17-21).

Regarding claim 4, Nichani discloses that the training of the search tool for the respective model for each of the plurality of sub-regions is performed by using a correlation search (Col. 11, lines 16-19).

Regarding claim 6, Nichani discloses a method for inspecting a spatially distorted pattern (Col. 3, lines 65-67). The method comprises running a coarse alignment tool to approximately locate the pattern (Col. 11, lines 9-11), using search tree information (Col. 9, lines 17-21) and an approximate location of a root sub-region found by the coarse alignment tool (Col. 11, lines 6-11) to locate a plurality of sub-regions sequentially in an order according to the search tree information each of the sub-regions being of a size small enough such that a conventional inspecting method can reliably inspect each of the sub-regions (Col. 10, lines 17-21). The method also includes inspecting each of the sub-regions (Col. 13, lines 53-54).

Regarding claim 14, Nichani discloses a method and apparatus for inspecting a spatially distorted pattern (Abstract, lines 1-2). The arguments analogous to those presented above for claim 1 are applicable to claim 14. coarse alignment 56, a search mechanism (Col. 3, lines 65-67) for locating each of the sub-regions sequentially in an ordered based on search tree information (Col. 4, lines 1-4), and an inspector for inspecting the sub-regions (Col. 4, lines 28-29).

Regarding claim 21, the arguments analogous to those presented above for claims 1, 6, and 14 are applicable to claim 21.

Regarding claim 25, the arguments analogous to those presented above for claim 3 are applicable to claim 25.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2623

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al.

(5,673,334).

Claim 27 is drawn to a medium having stored therein machine-readable information.

While Nichani does not appear to explicitly mention a medium having stored therein machine-readable information, this would have been clearly obvious in light of Nichani's disclosure.

Note, Nichani's disclosure mentions "software" (Col. 9, line 59) and "microprocessor" (Col. 1, line 36), thereby establishing his system as being or relating to a computer based system. The arguments analogous to those presented above for claim 1 are applicable to claim 27.

Regarding claim 28, the arguments analogous to those presented above for claim 3 are applicable to claim 28.

9. Claims 2, 10, 17, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Cipolla et al. (5,581,276).

Regarding claim 2, the arguments analogous to those presented above for claim 1 are applicable to claim 2. Nichani does not recognize the need for the size of the sub-regions to be small enough such that each of the sub-regions is well approximated by an affine transformation. However, Cipolla et al. ("Cipolla") teaches that it is known that the size of an image region must be sufficiently small such that the region is well approximated by an affine transformation (Col. 8, lines 62-64). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the plurality of sub-regions as disclosed by Nichani to

specify the size of each of the sub-regions being small enough such that each sub-region is well approximated by an affine transform, as taught by Cipolla, in order to reliably inspect each of the sub-regions.

Regarding claims 10, 17, and 24, the arguments analogous to those presented above for claim 2 are applicable to claims 10, 17, and 24.

10. Claims 5, 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Aiyer et al. (5,777,729).

Regarding claim 5, Nichani discloses training the inspection tool for the respective model for each of the sub-regions (Col. 6, lines 26-30). Nichani does not disclose performing the training by using a golden template comparison method. However, Aiyer et al. ("Aiyer") teaches that it is known to train the inspection tool for the respective model for each of the plurality of sub-regions performed by using a golden template comparison method (Col. 7, lines 64-67 and Col. 8, lines 1-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the training of the inspection tool disclosed by Nichani to use the golden template comparison method, as taught by Aiyer, in order to provide more effective training.

Regarding claim 13, Aiyer discloses inspecting each of the sub-regions by a golden template method (Col. 7, lines 46-57).

Regarding claim 20, the arguments analogous to those presented above for claims 13 and 14 are applicable to claim 20.

11. Claims 11, 18, 26, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Miyake (6,009,213).

Regarding claim 11, Nichani discloses inspecting each of the sub-regions (Col. 13, lines 53-54). Nichani does not recognize using transformation information from located ones of sub-regions to interpolate transformation information for a sub-region when the sub-region cannot be located. However, Miyake teaches that it is known to use interpolation based on transformed information for a sub-region (Col. 5, lines 62-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the inspection method disclosed by Nichani to include interpolation based on transformation information, as taught by Miyake, and then use the interpolated transformation information to inspect the sub-region in order to inspect sub-regions that cannot be located.

Regarding claims 18 and 26, Miyake discloses an image processing apparatus and method (Col. 2, lines 46-47). The arguments analogous to those presented above for claim 11 are applicable to claims 18 and 26.

Regarding claim 32, the arguments analogous to those presented above for claims 27 and 11 are applicable to claim 32. Nichani discloses running a search tool on the sub-regions (Col. 3, lines 65-67). Nichani does not disclose running a search tool on the sub-region based on the interpolated transformation information. However, Miyake teaches that it is known to use interpolation based on transformed information for a sub-region (Col. 5, lines 62-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the search tool disclosed by Nichani to include running the search tool on the sub-region based on the interpolated transformation information, as taught by Miyake, in order to inspect sub-regions that cannot be located.

12. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Clark et al. (6,370,197).

Regarding claim 33, Nichani discloses using search tree information to locate the plurality of sub-regions (Col. 9, lines 17-21). Nichani does not disclose dividing the sub-regions into smaller sub-regions when one of the sub-regions cannot be located. However, Clark et al. ("Clark") teaches that it is known to further sub-divide a block or "sub-region" when a condition is not met after inspection of the sub-region (Abstract, lines 2-7). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the search tool disclosed by Nichani to include dividing one of the sub-regions into a plurality of smaller sub-regions when the one of the sub-regions cannot be located during the use of the search tree information by applying Clark's teaching to further sub-divide a sub-region when a condition is not met, in order to locate the sub-region that could not be located by the search tree information.

13. Claims 12 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Dance et al. (6,285,799).

Regarding claim 12, Nichani discloses training a search tool and an inspection tool for a respective model for each of sub-regions (Col. 6, lines 26-30). Nichani does not recognize using the respective models for some of the sub-regions to determine respective transformation information. However, Dance et al. ("Dance") teaches that it is known to determine transformation information (Col. 9, lines 63-64). Dance also teaches that it is known to predict registration results by using the respective transformation information (Col. 9, lines 63-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the training method disclosed by Nichani to include determining

transformation information and predicting registration results by using the transformation information, as taught by Dance, in order to compensate for training that was not successfully performed on a sub-region.

Regarding claim 19, Dance discloses a method and apparatus (Col. 3, line 21). The arguments analogous to those presented above for claim 12 are applicable to claim 19.

14. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Barnard (5,604,819).

Regarding claim 29, the arguments analogous to those presented above for claim 6 and 27 are applicable to claim 29. Nichani discloses inspecting each of the sub-regions (Col. 13, lines 53-54). Nichani does not disclose producing a difference image or a match image. However, Barnard teaches that it is known to produce difference images (Col. 16, lines 32-33) as well as match images (Col. 13, lines 26-27). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the inspection as disclosed by Nichani to include producing difference images and match images, as taught by Barnard, in order to further inspect each sub-region.

15. Claims 8, 16, 23, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Companion et al. (6,330,354) in further view of Barnard (5,604,819).

Regarding claim 8, Nichani discloses inspecting each of the sub-regions (Col. 13, lines 53-54). Nichani does not recognize the need to produce a difference image or a match image. However, Companion teaches that it is known to produce a difference image for each of the sub-regions (Col. 5, lines 1-7). Companion also teaches that it is known to combine the difference

images into a single difference image (Col. 6, lines 10-12). Companion does not disclose producing a match image. However, Barnard teaches that it is known to produce difference images (Col. 16, lines 32-33) as well as match images (Col. 13, lines 26-27). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the inspection as disclosed by Nichani to include producing and combining difference images, as taught by Companion, as well as match images, as taught by Barnard, in order to further inspect each sub-region.

Regarding claim 16, the arguments analogous to those presented above for claim 8 are applicable to claim 16.

Regarding claim 23, the arguments analogous to those presented above for claim 8 are applicable to claim 23.

Regarding claim 30, the arguments analogous to those presented above for claims 27 and 8 are applicable to claim 30.

16. Claims 7, 15, 22, and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Michael et al. (5,825,483) in further view of Murata et al. (5,699,443).

Regarding claim 7, Nichani does not recognize producing a distortion vector field for each of the sub-regions. However, Michael et al. ("Michael") teaches that it is known to combine all location information to produce a distortion vector field for each of the sub-regions (Col. 7, lines 52-63). Michael does not recognize using the distortion vector fields to make a pass/fail decision. Murata et al. ("Murata") teaches that it is known to use a vector field to make a pass/fail decision based on user-specified tolerances (Col. 28, lines 19-24). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the method disclosed by

Nichani to include producing a distortion vector field, as taught by Michael, and use the vector field to make a pass/fail decision, as taught by Murata, in order to compare the images.

Regarding claim 15, the arguments analogous to those presented above for claim 7 are applicable to claim 15.

Regarding claim 22, the arguments analogous to those presented above for claim 7 are applicable to claim 22.

Regarding claim 34, the arguments analogous to those presented above for claims 6 and 7 are applicable to claim 34.

Regarding claim 35, the arguments analogous to those presented above for claims 14 and 7 are applicable to claim 35.

Regarding claim 36, the arguments analogous to those presented above for claims 6, 7, and 27 are applicable to claim 36.

17. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Michael et al. (5,825,483) in further view of Murata et al. (5,699,443) and Barnard (5,604,819).

Regarding claim 31, the arguments analogous to those presented above for claim 7 is applicable to claim 31.

18. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Michael et al. (5,825,483) in further view of Murata et al. (5,699,443), Companion et al. (6,330,354), and Barnard (5,604,819).

Regarding claim 9, the arguments analogous to those presented above for claims 7 and 8 are applicable to claim 9.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Pat. No. 5,673,334 to Nichani et al. for method and apparatus for inspection of characteristics on non-rigid packages;

U.S. Pat. No. 5,581,276 to Cipolla et al. for 3D Human interface apparatus using motion recognition based on dynamic image processing;

U.S. Pat. No. 5,777,729 to Aiyer for wafer inspection method;

U.S. Pat. No. 5,604,819 to Barnard for determining offset between images of an IC;

U.S. Pat. No. 6,330,354 to Companion et al. for method of analyzing visual inspection image data to find defects on a device;

U.S. Pat. No. 5,825,483 to Michael et al. for multiple field of view calibration plate having a regular array of features for use in semiconductor manufacturing;

U.S. Pat. No. 6,370,197 to Clark et al. for video compression scheme;

U.S. Pat. No. 6,285,799 to Dance et al. for apparatus and method for measuring a two-dimensional point spread function of a digital image acquisition system;

U.S. Pat. No. 6,009,213 to Miyake for image processing apparatus and method; and

U.S. Pat. No. 5,699,443 to Murata et al. for method of judging background/foreground position relationship between moving subjects.

Art Unit: 2623

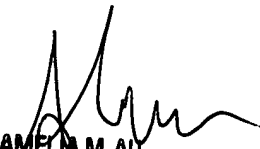
Contact Information

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Virginia M Kibler whose telephone number is (703) 306-4072. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

VK
October 2, 2002


AMELIA M. AU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600